

U. S. ATOMIC ENERGY COMMISSION
REGION I
DIVISION OF COMPLIANCE

February 10, 1967

CO REPORT NO. 47/67-1

Title: U. S. ARMY MATERIALS RESEARCH AGENCY - WATERTOWN ARSENAL
LICENSE NO. R-65

Date of Visit: January 19, 1967

By : J. R. Sears, Reactor Inspector

*J.P.O. Kelly
for*

SUMMARY

A new neutron spectrometer experiment is being installed. It will be equipped with a device to warn against an open shutter.

A spill during discharge of a vial containing radioactive liquid resulted in a 100 mr exposure to an operator's eye.

The efficiency of absolute filters in the ventilation system has never been demonstrated by test.

No violations of the Federal Regulations nor of the terms of the license were observed during the visit, or during the review of the records.

DETAILS

I. Scope of Visit

An unannounced visit was made to the Watertown Arsenal reactor of the U. S. Army Materials Research Agency at Watertown, Massachusetts, by Mr. John R. Sears, Reactor Inspector, Region I, Division of Compliance, on January 19, 1967. The visit included

(continued)

Scope of Visit (continued)

a tour of the facility, review of operating, health physics and maintenance records, and discussions with experimentalists, members of the Safety Committee and members of the operating staff.

During the visit, discussions were held with the following:

Mr. John O'Connor, Director, Reactor Facility
Mr. Charles Dady, Health Physicist
Mr. Leo Foley, Health Physicist
Mr. John Antal, Nuclear Physicist, Member of
Safety Committee
Mr. Joseph Vella, Engineer

II. Results of Visit

A. Beam Experiment

Equipment is being installed for solid state studies in a beam experiment at a horizontal beam hole. The facility will be housed in a small concrete block house with an open labyrinth entrance. The beam hole will be equipped with a manual shutter which will be operated by the experimenter from outside the block house. No radiation warning device was observed to be installed, as yet, at this facility.

B. Spill

The inspector examined written reports of a recent spill.

Six ml of $\text{Cu}(\text{NO}_3)_2 + \text{NH}_4\text{H}_2\text{SO}_3 + \text{NH}_4\text{I}$ were irradiated in four heat sealed polyethylene vials in a rabbit tube in a slant hole. Total activity at discharge was calculated to be 12 uc.

(continued)

Results of Visit (continued)

The vials are reported to have become slightly wedged in the rabbit. In attempting to remove the first vial, the operator squeezed the tongs too hard. The cap popped off, and approximately $\frac{1}{2}$ ml of solution was lost. Some splashed on to the operator's coveralls, and one drop struck him on the eye. He ran immediately to a sink about 10 yards away and washed the eye. He reported to the health physicist, who wipe smeared the affected area, with no indication of residual contamination. The health physicist directed the operator to shower and then to report to the Arsenal first-aid clinic. The operator's eye was reported to be, by now, quite bloodshot from soap and water washings. A medical doctor examined the operator and declared that there appeared to be no damage to the eye. As a precaution, he directed the operator to walk about the Arsenal grounds in the open air "in order to allow the radioactivity to evaporate".

The reactor health physicists reported to the inspector that, fortunately, the operator had been warmly dressed and so had suffered no ill effects before he was found and returned to the safety of a warm building.

The inspector reviewed calculations which were stated to have been based upon conservative assumptions including a one minute total exposure time. These calculations indicate that the maximum total exposure to the operator's eye was 100 mr.

The inspector also reviewed records which show that a written report of this incident was presented to the Safety Committee on January 16, 1967. As a result, a Retraining Bulletin was issued to all operators which specifies protective equipment, including goggles, which must be worn during discharge of such samples. The Bulletin also states that a maximum of three vials of the specified diameter shall be placed in one rabbit tube.

(continued)

Results of Visit (continued)

C. Absolute Filters

The present ventilation system includes a fan, an absolute filter and an automatic isolation damper in ductwork discharging to the stack. Mr. O'Connor stated that, for 5 Mw operation, the fan will be relocated downstream of the filter and damper to insure that any leakage on the exhaust side of the filter will be into the duct and not vice versa. The absolute filter is not preceded by a roughing filter. The absolute filter is changed about every six months on the basis of a pressure drop across it. Mr. O'Connor stated that efficiency tests of the filter, as installed, have never been made. He stated that the change of gaseous and particulate continuous radiation monitor readings on the outlet versus the inlet side of the filter gives him an indication of its removal efficiency.

D. Records

The inspector reviewed operating logbooks, minutes of meetings of the Safety Committee and health physics records.

Following are records of gaseous and liquid releases for January - November 1966.

GASEOUS RELEASE

<u>Month</u>	<u>Activity Released</u> (c)	<u>Average Release Rate</u> (uc/sec)	<u>*Fraction of Limit</u> (%)	<u>Maximum Release Rate</u> (uc/sec)	<u>**Fraction of Limit</u> (%)
Jan.	2.8	1.1	0.3	1.9(1)	4.8
Feb.	1.9	0.72	0.2	1.1(1)	2.8
Mar.	2.9	1.1	0.3	2.1(1)	5.2

(continued)

Results of Visit (continued)

<u>Month</u>	<u>Activity Released (c)</u>	<u>Average Release Rate (uc/sec)</u>	<u>*Fraction of Limit (%)</u>	<u>Maximum Release Rate (uc/sec)</u>	<u>**Fraction of Limit (%)</u>
Apr.	2.1	0.78	0.2	1.3(1)	3.3
May	2.1	0.81	0.2	1.1(1)	2.8
June	4.8	1.8	0.5	2.6(1)	6.6
July	4.5	1.7	0.4	2.6(1)	6.5
Aug.	5.8	2.2	0.5	2.6(1)	6.5
Sept.	6.6	2.5	0.6	2.6(1)	6.4
Oct.	6.3	2.4	0.6	2.8(1)	7.0
Nov.	5.3	2.0	0.5	3.1(1)	7.7

*Facility is allowed to release A-41 at average rate of 400 uc/sec.

**Note: (1) A-41 is the only gaseous nuclide measured.

(2) Maximum release rate not recorded as such; maximum release rate was obtained by using the highest daily average release and assuming all activity was released in a three hour period, i.e., highest daily average release rate. x 8 = maximum release rate.

(continued)

Results of Visit (continued)

LIQUID RELEASE

	<u>MONTH</u>			
	<u>Feb.</u>	<u>July</u>	<u>Oct.</u>	<u>Nov.</u>
Activity Released (c)	1.94(-4)	1.5(-3)	1.9(-5)	9.9(-4)
Volume prior to dilution (gal.)	2.7(4)	3.7(4)	3.1(4)	4.1(3)
Average concentration prior to dilution (uc/ml)	1.9(-6)	1.1(-5)	9.7(-7)	6.4(-5)
Volume of dilution (gal.)	---	1.4(+5)	---	1.0(+5)
Average concentration after dilution (uc/ml)	1.9(-6)	2.3(-6)	9.7(-7)	2.5(-6)
Fraction of limit (%) - (3×10^{-6})	63	77	32	83
Maximum concentration after dilution (uc/ml)	---	2.3(-6)	---	---
Number of discharges	1	2	1	1

No releases for months not noted.

(continued)

Results of Visit (continued)

SOLID WASTE

	<u>MONTH</u>
	<u>September</u>
Activity shipped (c)	2.0(-2)
Total volume shipped (ft ³)	2.9(-2)
Average concentration of radioactive material (uc/cc)	2.4(-3)

The integrated power in Mwd's for January - November was:

<u>Month</u>	<u>Mwd</u>	<u>Month</u>	<u>Mwd</u>
Jan.	11.1	July	11.1
Feb.	7.8	Aug.	15.3
Mar.	13.0	Sept.	12.2
Apr.	8.2	Oct.	13.8
May	5.9	Nov.	12.5
June	12.9		

The inspector reviewed records of shield surveys, area smears, and personnel exposures. There were no over-exposures of personnel from January - November 1966, the time period reviewed.

(continued)

Results of Visit (continued)

E. Exit Interview

The inspector discussed with Messrs. O'Connor, Dady, Foley, and Dr. Antal the possibility of hazard resulting from an experimenter working for an extended period within the concrete block house around the spectrometer after he had inadvertently left the shutter open. Dr. Antal stated that he would install a visual radiation warning device to remind himself to close the shutter.

Both Messrs. Dady and Foley agreed that there was a need to educate the medical doctor at the industrial clinic in the philosophy and the techniques for treating patients who may be contaminated with radiation. Mr. Dady stated that the doctor had been with the Arsenal for only one month and that the health physicists have planned a definite program for training him in the proper procedures.

The inspector's review of the minutes of the Safety Committee showed that the Committee was in favor of an in-place test of the removal efficiency of the absolute filters. Mr. O'Connor stated that he did not intend making such a test unless it was legally required since no credit is taken for the filters in calculating the consequences of the maximum credible accident. In reply to the question of how he would cope with clean-up after the MCA, he stated that the MCA was incredible in the first place.

Owing to the unannounced nature of this visit, Col. Kellogg, the new Commanding Officer of the Arsenal, was not available for interview.